SUBSECTION 8.5

Noise

8.5 Noise

8.5.1 Introduction

The project site is located in the City and County of San Francisco (CCSF). Generally, the design basis for noise control is the minimum, or most stringent, noise level required by any of the applicable laws, ordinances, regulations, or standards (LORS). Therefore, noise from this project is evaluated against San Francisco's General Plan and Noise Ordinance requirements.

Subsection 8.5.2 presents the fundamentals of acoustics while a description of the LORS is presented in Subsection 8.5.3. The affected environment is described in Subsection 8.5.4 and the environmental consequences (i.e., the potential project effects from both construction and operation) are analyzed in Subsection 8.5.5. Mitigation measures proposed to reduce potential impacts below the level of significance are presented in Subsection 8.5.6. The involved agencies and agency contacts are listed in Subsection 8.5.7. The permits and permitting schedule are discussed in Subsection 8.5.8. Subsection 8.5.9 provides the noise references.

Acoustic data was developed for the previously proposed San Francisco Electric Reliability Project (SFERP) at the corner of 23rd and Illinois Streets. Additional noise evaluations were made for that site to support the proceedings for the licensing of the larger Potrero Power Plant Unit 7 (PPPU7) Project (00-AFC-4). Because acoustic data from the 23rd and Illinois Streets site is considered representative of the proposed new location of the SFERP, this subsection refers to portions of the PPPU7 AFC filings (Dames & Moore, 2000) and the CEC's FSA (CEC, 2002) for the PPPU7 project.

8.5.2 Fundamentals of Acoustics

Acoustics is the study of sound, and noise is defined as unwanted sound. Airborne sound is a rapid fluctuation or oscillation of air pressure above and below atmospheric pressure creating a sound wave. Acoustical terms used in this subsection are summarized in Table 8.5-1.

TABLE 8.5-1
Definitions of Acoustical Terms

Term	Definition
Ambient Noise Level	The composite of noise from all sources near and far. The normal or existing level of environmental noise or sound at a given location. The ambient level is typically defined by the L_{eq} level.
Background Noise Level	The underlying ever-present lower level noise that remains in the absence of intrusive or intermittent sounds. Distant sources, such as traffic, typically make up the background. The background level is generally defined by the L_{90} percentile noise level.
Intrusive	Noise that intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends upon its amplitude, duration, frequency, time of occurrence, tonal content, the prevailing ambient noise level as well as the sensitivity of the receiver. The intrusive level is generally defined by the L_{10} percentile noise level.
Decibel (dB)	A unit describing the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure, which is 20 micropascals (20 micronewtons per square meter).

TABLE 8.5-1
Definitions of Acoustical Terms

Term	Definition
A-Weighted Sound Level (dBA)	The sound level in decibels as measured on a sound level meter using the A-weighted filter network. The A-weighted filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise. All sound levels in this report are A-weighted.
Equivalent Noise Level (L_{eq})	The average A-weighted noise level, on an equal energy basis, during the measurement period.
Percentile Noise Level (L_n)	The noise level exceeded during n percent of the measurement period, where n is a number between 0 and 100 (e.g., L_{90})
Day-Night Noise Level (L_{dn} or DNL)	The average A-weighted noise level during a 24-hour day, obtained after addition of 10 decibels from 10:00 p.m. to 7:00 a.m.

The most common metric is the overall A-weighted sound level measurement that has been adopted by regulatory bodies worldwide. The A-weighting network measures sound in a similar fashion to how a person perceives or hears sound, thus achieving very good correlation in terms of how to evaluate acceptable and unacceptable sound levels.

A-weighted sound levels are typically measured or presented as equivalent sound pressure level (L_{eq}), which is defined as the average noise level, on an equal energy basis for a stated period of time, and is commonly used to measure steady state sound or noise that is usually dominant. Statistical methods are used to capture the dynamics of a changing acoustical environment. Statistical measurements are typically denoted by $L_{xx,}$ where xx represents the percentile of time the sound level is exceeded. The L_{90} is a measurement that represents the noise level that is exceeded during 90 percent of the measurement period. Similarly, the L_{10} represents the noise level exceeded for 10 percent of the measurement period.

Another metric used in determining the impact of environmental noise is the differences in response that people have to daytime and nighttime noise levels. During the nighttime, exterior background noises are generally lower than the daytime levels. However, most household noise also decreases at night and exterior noise becomes more noticeable. Furthermore, most people sleep at night and are sensitive to intrusive noises. To account for human sensitivity to nighttime noise levels, the Day-Night Sound Level (L_{dn} or DNL) was developed. L_{dn} is a noise index that accounts for the greater annoyance of noise during the nighttime hours.

L_{dn} values are calculated by averaging hourly L_{eq} sound levels for a 24-hour period, and apply a weighting factor to nighttime L_{eq} values. The weighting factor, which reflects the increased sensitivity to noise during nighttime hours, is added to each hourly L_{eq} sound level before the 24-hour L_{dn} is calculated. For the purposes of assessing noise, the 24-hour day is divided into two time periods, with the following weightings:

- Daytime: 7 a.m. to 10 p.m. (15 hours) Weighting factor of 0 dB.
- Nighttime: 10 p.m. to 7 a.m. (9 hours) Weighting factor of 10 dB.

The two time periods are then averaged to compute the overall L_{dn} value. For a continuous noise source, the L_{dn} value is easily computed by adding 6.4 dB to the overall 24-hour noise level (L_{eq}). For example, if the expected continuous noise level from the power plant was 60.0 dBA, the resulting L_{dn} from the plant would be 66.4 dBA.

The effects of noise on people can be listed in three general categories:

- Subjective effects of annoyance, nuisance, dissatisfaction.
- Interference with activities such as speech, sleep, learning.
- Physiological effects such as startling and hearing loss.

In most cases, environmental noise produces effects in the first two categories only. However, workers in industrial plants typically experience noise effects in the last category. No completely satisfactory way exists to measure the subjective effects of noise, or to measure the corresponding reactions of annoyance and dissatisfaction. This lack of a common standard is primarily due to the wide variation in individual thresholds of annoyance and habituation to noise. Thus, an important way of determining a person's subjective reaction to a new noise is by comparing it to the existing or "ambient" environment to which that person has adapted. In general, the more the level or the tonal (frequency) variations of a noise exceed the previously existing ambient noise level or tonal quality, the less acceptable the new noise will be, as judged by the exposed individual.

Table 8.5-2 shows the relative A-weighted noise levels of common sounds measured in the environment and in industry for various sound levels.

TABLE 8.5-2
Typical Sound Levels Measured in the Environment and Industry

Noise Source at a Given Distance	A-Weighted Sound Level in Decibels	Noise Environments	Subjective Impression
Shotgun (at shooter's ear)	140	Carrier flight deck	Painfully loud
Civil defense siren (100 ft)	130		
Jet takeoff (200 ft)	120		Threshold of pain
Loud rock music	110	Rock music concert	
Pile driver (50 ft)	100		Very loud
Ambulance siren (100 ft)	90	Boiler room	
Pneumatic drill (50 ft)	80	Noisy restaurant	
Busy traffic; hair dryer	70		Moderately loud
Normal conversation (5 ft)	60	Data processing center	
Light traffic (100 ft); rainfall	50	Private business office	
Bird calls (distant)	40	Average living room library	Quiet
Soft whisper (5 ft); rustling leaves	30	Quiet bedroom	
	20	Recording studio	
Normal breathing	10		Threshold of hearing

Source: Beranek, 1998.

8.5.3 Laws, Ordinances, Regulations, and Standards

The following are the LORS that apply to noise generated by the project. They are summarized in Table 8.5-3.

TABLE 8.5-3
Applicable Laws, Ordinances, Regulations, and Standards

LORS	Purpose	Applicability (Supplement A Section Explaining Conformance)
Federal Offsite		
USEPA	Guidelines for state and local governments.	Subsection 8.5.3.1.1.
Federal Onsite		
OSHA	Exposure of workers over 8-hour shift limited to 90 dBA.	Subsections 8.5.3.1.2, 8.5.5.2.1 and 8.5.5.3.1. Also see Subsection 8.7, Worker Safety
State Onsite		
Cal/OSHA 8 CCR Article 105 Sections 095 et seq.	Exposure of workers over 8-hour shift limited to 90 dBA.	Subsections 8.5.3.2.1, 8.5.5.2.1 and 8.5.5.3.1. Also see Subsection 8.7, Worker Safety
State Offsite		
Calif. Vehicle Code Sections 23130 and 23130.5	Regulates vehicle noise limits on California highways.	Delivery trucks and other vehicles will meet Code requirements. Subsection 8.5.3.2.2.
Local		
California Government Code Section 65302	Requires local government to prepare plans that contain noise provisions.	City and County of San Francisco, Subsection 8.5.3.3.
San Francisco – Police Code Article 29, Sections 2901.11, 2909, 2915	Establishes a 75 dBA standard for industrial districts (M-2). Refer to Table 8.5-4 for detailed noise limits by zoning district. Provides a basis for public complaints if noises exceed the ambient by more than 5 dBA.	Subsections 8.5.3.3 and 8.5.5.3.4.
San Francisco – General Plan	The General Plan only addresses transportation-related noise.	Not Applicable.

8.5.3.1 Federal

8.5.3.1.1 USEPA. Guidelines are available from the USEPA (1974) to assist state and local government entities in development of state and local LORS for noise. Because there are local LORS that apply to this project, these guidelines are not applicable.

8.5.3.1.2 OSHA. Onsite noise levels are regulated, in a sense, through the Occupational Safety and Health Act of 1970 (OSHA). The noise exposure level of workers is regulated at 90 dBA, over an 8-hour work shift to protect hearing (29 Code of Federal Regulations [CFR] 1910.95).

Onsite noise levels will generally be in the 70- to 85-dBA range. Areas above 85 dBA will be posted as high noise level areas and hearing protection will be required. The power plant will implement a hearing conservation program for applicable employees and maintain exposure levels below 90 dBA.

8.5.3.2 State of California

8.5.3.2.1 Cal-OSHA. The California Department of Industrial Relations, Division of Occupational Safety and Health enforces California Occupational Safety and Health Administration (Cal-OSHA) regulations, which are the same as the federal OSHA regulations described previously. The regulations are contained in Title 8 of the California Code of Regulations (CCR), General Industrial Safety Orders, Article 105, Control of Noise Exposure, Sections 5095, et seq.

8.5.3.2.2 California Vehicle Code. Noise limits for highway vehicles are regulated under the California Vehicle Code, Sections 23130 and 23130.5. The limits are enforceable on the highways by the California Highway Patrol and the County Sheriff Offices.

8.5.3.3 Local

The California State Planning Law (California Government Code Section 65302) requires that all cities, counties, and entities (such as multi-city port authorities) prepare and adopt a General Plan to guide community change. The San Francisco General Plan contains noise provisions for transportation-related sources. The City Police Code, Article 29, contains provisions for stationary sources and establishes a 75 dBA standard for industrial districts (M-2). Table 8.5-4 identifies noise limits by zoning district. In addition, Article 29 provides a basis for public complaints of noises exceeding the ambient by more than 5 dBA.

TABLE 8.5-4
San Francisco Noise Level Limits by Zoning District

Zoning District	Time Period	Sound Level (dBA)
R-1-D, R-1, R-2 – Residential one and two houses	10 p.m. to 7 a.m. 7 a.m. to 10 p.m.	50 55
R-3, R-3.5, R-4, R-5, R-3-C, R-3.5-C, R-4-C, R-5-C – Residential multiple households and commercial/residential	10 p.m. to 7 a.m. 7 a.m. to 10 p.m.	55 60
C-1, C-2, C-3-O, C-3-R Commercial and Commercial/residential	10 p.m. to 7 a.m. 7 a.m. to 10 p.m.	60 70
M-1 – Light Industrial	Anytime	70
M-2 – Heavy Industrial	Anytime	75

Source: Dames & Moore, 2000.

8.5.4 Affected Environment

The proposed San Francisco Electric Reliability Project (SFERP) site is an approximately 4-acre parcel in the Potrero District between Cesar Chavez and 25th streets. The project site

(Figure 8.5-1) is located along the eastern side of the San Francisco Peninsula, near the San Francisco Bay and south of Warm Water Cove. Existing uses on, and adjacent to, the site are primarily industrial and commercial. The site currently contains a cement batch plant, which will be relocated. On the west side of the project (between the project site and Illinois Street) the San Francisco Municipal Railway (MUNI) is planning to build an Operations and Maintenance facility for its vehicles. The area directly to the east is currently used as temporary storage for semi trailers for the Moscone Convention Center. To the south is the Port of San Francisco's Pier 80 cargo terminal. The main street entrance to the cargo terminal is Cesar Chavez Street.

A residentially zoned neighborhood (zoned RH-3) exists along Tennessee Street, north of Tubbs Street, approximately 2,000 feet from the site (referred to as Receptor 3 or R3 as shown on Figure 8.5-1). Noise from the existing Potrero Power Plant is not audible at any of these residences as a result of distance and the noise attenuating effects of the intervening industrial buildings (Dames & Moore, 2000). Therefore, noise from SFERP would not be audible since the plant is even farther from these residences. Other residences are located farther away in the Potrero Hill neighborhood west of Interstate 280 (CEC, 2002). See also Figure 8.4-3.

Additional dwelling units are located on the southwest corner of the intersection of 23rd Street and Minnesota Street (about 2,000 feet from the proposed facility). This building was under construction when the PPPU7 AFC was filed and was the location of the 25-hour noise monitoring (Monitoring Location 1, shown as ML1 on Figure 8.5-1) conducted for PPPU7 (Dames & Moore, 2000). Additional dwelling units are located south of ML1, at Minnesota Street and 24th Street (R2 on Figure 8.5-1), Minnesota Street and 25th Street (R1 on Figure 8.5-1) and Cesar Chavez and Indiana streets (R4 on Figure 8.5-1). All of these are approximately 2,000 feet from the proposed facility.

The closest dwelling units (R1) are located at the corner of Minnesota and 25th streets. Although these units are only 1,600 feet from the project site, they were not considered the nearest residential receptors because there are located in an area that is zoned M-2, Heavy Industrial, and residents living in an industrially zoned area would not have the same expectation of low ambient noise levels as those living in a residentially zoned area (Edwards, 2005).

Sources of environmental noise in the project area are primarily transportation-related.

8.5.4.1 Ambient Noise Survey

As part of the PPPU7 proceeding, measurements were collected on August 18 and 19, 1999 and on October 11 and 12, 1999 at four locations depicted in Figure 8.5-1. Since this monitoring was conducted, there have been no significant industrial changes in the area. Measurement results are summarized in Tables 8.5-5 through 8.5-7 (Dames & Moore, 2000).

TABLE 8.5-5
Short Term Sound Level Measurements, Measured on August 18 and 19, 1999

Time	L_{eq}	L_{10}	L_{50}	L_{90}	L_{min}	L_{max}
ML2: Approximately 100 Feet South of 23rd Street						
3:00 a.m. – 4:00 a.m.	61.7	62.3	61.5	58.7	54.5	71.9
2:00 p.m. – 3:00 p.m.	65.1	68.0	64.0	57.1	55.7	77.6
7:00 p.m. – 8:00 p.m.	64.5	66.9	63.0	57.2	52.6	74.4
ML3: Illinois Street Property Line at PG&E's Existing Potrero Substation						
4:00 a.m. – 5:00 a.m.	54.2	56.4	52.0	51.4	50.9	74.1
3:00 p.m. – 4:00 p.m.	61.8	64.2	59.9	58.7	57.4	73.4
8:00 p.m. – 9:00 p.m.	60.5	62.5	55.8	55.5	53.1	78.1
ML4: Approximately 50 Feet from the Intersection of 22nd and Missouri						
1:30 a.m. – 2:30 a.m.	49.8	52.5	48.9	45.4	43.2	60.8
1:00 p.m. – 2:00 p.m.	58.6	60.7	56.0	53.5	51.5	75.4
9:00 p.m. – 10:00 p.m.	50.6	52.0	49.4	46.6	42.9	69.9

Notes:

The temperature during the measurement periods ranged from approximately 55 degrees to 75 degrees.

The wind speed was less than 5 mph. The sky ranged from clear to overcast. There was no precipitation during the measurement periods. The humidity was not recorded.

All sound levels are expressed in dBA.

Source: Dames & Moore, 2002.

TABLE 8.5-6
25-Hour Sound Level Measurements, Offsite Measurement Location 1 (ML1) Sound Levels Measured on October 11 and 12, 1999, at ML1 Approximately 50 Feet from the Intersection of 23rd Street and Minnesota Avenue

Time	L_{eq}	L_{10}	L_{50}	L_{90}	L_{min}	L_{max}	Note
9:00 a.m. – 10:00 a.m.	68.6	71.9	63.5	58.9	55.4	90.7	1, 2, 3
10:00 a.m. – 11:00 a.m.	68.6	72.5	63.5	59.1	55.9	86.8	1, 2, 3
11:00 a.m. – 12:00 p.m.	68.0	71.6	63.5	57.1	46.1	90.3	1, 2, 3
12:00 p.m. – 1:00 p.m.	67.1	68.8	63.0	59.9	55.5	87.4	1, 2, 3
1:00 p.m. – 2:00 p.m.	66.2	68.9	62.0	57.2	46.9	84.9	1, 2, 3
2:00 p.m. – 3:00 p.m.	68.2	69.3	64.0	60.4	56.4	90.3	1, 2, 3
3:00 p.m. – 4:00 p.m.	66.1	68.7	62.4	60.1	55.4	83.2	1, 2, 3
4:00 p.m. – 5:00 p.m.	65.0	67.6	63.0	60.8	57.6	77.4	1, 2, 3
5:00 p.m. – 6:00 p.m.	65.6	68.1	62.4	60.0	56.8	83.5	1, 2, 3, 4
6:00 p.m. – 7:00 p.m.	66.2	67.8	61.5	59.3	56.2	87.8	1, 3
7:00 p.m. – 8:00 p.m.	63.8	66.3	60.0	56.4	52.6	83.0	1, 3
8:00 p.m. – 9:00 p.m.	60.9	61.8	56.6	54.3	49.7	83.0	1, 3
9:00 p.m. – 10:00 p.m.	61.7	63.5	57.9	53.8	51.5	83.0	1, 3
10:00 p.m. – 11:00 p.m.	59.2	60.1	54.6	51.6	49.5	79.1	1, 3
11:00 p.m. – 12:00 a.m.	57.3	57.3	52.6	49.9	47.8	80.5	1, 3
12:00 a.m. – 1:00 a.m.	56.3	58.0	52.0	49.5	48.5	72.3	1
1:00 a.m. – 2:00 a.m.	56.1	57.1	51.8	49.9	48.9	75.6	1

TABLE 8.5-6
25-Hour Sound Level Measurements, Offsite Measurement Location 1 (ML1) Sound Levels Measured on October 11 and 12, 1999, at ML1 Approximately 50 Feet from the Intersection of 23rd Street and Minnesota Avenue

Time	L_{eq}	L_{10}	L_{50}	L_{90}	L_{min}	L_{max}	Note
2:00 a.m. – 3:00 a.m.	55.9	57.2	51.5	49.8	48.9	78.9	1
3:00 a.m. – 4:00 a.m.	58.8	59.1	50.3	47.4	44.7	80.1	1
4:00 a.m. – 5:00 a.m.	60.0	62.6	54.0	50.3	46.7	78.8	1
5:00 a.m. – 6:00 a.m.	61.5	62.4	55.5	53.4	51.0	82.7	1
6:00 a.m. – 7:00 a.m.	65.8	69.1	59.9	55.9	52.5	84.7	1, 3
7:00 a.m. – 8:00 a.m.	68.3	70.5	61.6	57.6	54.7	89.2	1, 2, 3
8:00 a.m. – 9:00 a.m.	66.8	69.9	61.8	58.0	55.6	83.5	1, 2, 3
9:00 a.m. – 10:00 a.m.	65.3	68.1	61.3	57.1	54.6	80.7	1, 2, 3

Notes:

All sound levels are expressed in dBA.

The temperature during the measurement periods ranged from approximately 55 degrees to 75 degrees.

The wind speed was less than 5 mph. The sky ranged from clear to overcast. There was no precipitation during the measurement periods. The humidity was not recorded.

1. General vehicular traffic.
2. Construction activity (construction vehicles, power tools, banging and clanging of materials) at new live/work/loft.
3. Industrial activity at adjacent businesses.
4. Helicopter overflights.

Source: Dames & Moore, 2002.

TABLE 8.5-7
Short Term Sound Level Measurements, Measured on October 11 and 12, 1999

Time	L_{eq}	L_{10}	L_{50}	L_{90}	L_{min}	L_{max}
ML2: Approximately 100 Feet South of 23rd Street						
10:00 a.m. – 11:00 a.m.	63.5	64.4	58.5	55.6	52.6	79.7
7:00 p.m. – 8:00 p.m.	62.9	66.5	58.1	54.0	51.0	77.7
11:00 p.m. – 12:00 a.m.	60.2	64.0	55.5	52.9	49.9	79.9
ML4: Approximately 50 Feet from the Intersection of 22nd and Missouri						
11:15 a.m. – 12:15 p.m.	55.3	56.5	54.0	53.0	52.4	67.5
8:15 p.m. – 9:15 p.m.	52.1	55.9	51.5	48.8	46.9	65.8
10:00 p.m. – 11:00 p.m.	49.8	52.1	48.9	46.9	46.0	67.1

Notes:

All sound levels are expressed in dBA.

The temperature during the measurement periods ranged from approximately 55 degrees to 75 degrees.

The wind speed was less than 5 mph. The sky ranged from clear to overcast. There was no precipitation during the measurement periods. The humidity was not recorded.

ML2: Primary noise sources were vehicular traffic on nearby roads and industrial facilities. Noise from the Potrero Power Plant was audible during the measurement periods.

ML4: Primary noise sources were from vehicular traffic on Missouri Avenue and I-280. Noise from light industrial sources was periodically audible during the daytime. Noise from the Potrero Power Plant was not audible during the measurement periods.

Source: Dames & Moore, 2002.

During the ambient noise monitoring for PPPU7, the primary source of noise during the quietest portion of the night was identified as vehicular traffic at ML1. The average noise levels over the 25-hour period were 65.9 dBA L_{eq}, 68.2 dBA L_{dn} and 55.9 dBA L_{90}. The average L_{90} of the 4 quietest continuous hours at ML1 is 49 dBA. The average noise levels at the 3 short-term noise measurements sites were in the range of 60 to 65 dBA L_{eq} at ML2, 54 to 62 dBA L_{eq} at ML3, and 50 to 59 dBA L_{eq} at ML4. The existing Potrero Power Plant was noted to be 47 dBA and audible at ML2, which is located near the Mirant property boundary (CEC, 2002).

The measurements collected at ML1 for PPPU7 are expected to be very similar to those experienced at the closest existing dwelling units for the proposed new SFERP location, designated as Receptor 1 (R1), which is located on the corner of 25th and Minnesota streets. Supplemental measurements, which were collected on February 22 & 23, 2005 at ML5 (located at the Army Street Mini Storage on Cesar Chavez and Indiana streets), result in somewhat louder levels than reported for ML1. This is not unexpected as ML5 is closer to Interstate 280 than ML1 and Cesar Chavez is a larger thoroughfare than 23rd Street. Similarly, previous measurements at ML4, taken for PPPU7, would be representative of areas west of Interstate 280, where local and interstate vehicular traffic dominates the noise environment. Therefore, the data collected previously for PPPU7 were considered representative for use in this supplement and represent a conservative basis for this analysis, as it is quieter.

TABLE 8.5-8
Summary of Noise Measurements at ML5 (in dBA)

Date	Start Time	L_{eq}	L_{10}	L_{50}	L_{90}
22-Feb-05	16:00:00	69	70	69	67
22-Feb-05	17:00:00	67	69	66	64
22-Feb-05	18:00:00	69	70	69	67
22-Feb-05	19:00:00	67	69	67	65
22-Feb-05	20:00:00	66	67	65	63
22-Feb-05	21:00:00	65	67	65	62
22-Feb-05	22:00:00	64	66	64	61
22-Feb-05	23:00:00	62	64	62	58
23-Feb-05	0:00:00	61	64	60	56
23-Feb-05	1:00:00	60	63	59	54
23-Feb-05	2:00:00	59	62	57	52
23-Feb-05	3:00:00	59	62	57	52
23-Feb-05	4:00:00	60	63	59	54
23-Feb-05	5:00:00	64	66	63	60
23-Feb-05	6:00:00	67	69	67	64
23-Feb-05	7:00:00	69	71	69	67
23-Feb-05	8:00:00	69	71	69	68

8.5.5 Environmental Consequences

The proposed SFERP will produce noticeable noise but the noise levels will be in compliance with San Francisco's Noise Ordinance requirements for industrial properties. Noise will also be produced at the site during the construction phase of the project. Potential noise impacts from construction and operation activities are assessed in this subsection.

8.5.5.1 Significance Criteria

The City has established quantitative standards for determining appropriate noise levels for various zoning districts. These standards are summarized in Table 8.5-4. Noise impacts may be considered significant if project operational activities conflict with the Noise Level Limits by Zoning District summarized in Table 8.5-4.

In addition to the City criteria, the Energy Commission Staff concluded that a potential for a significant noise impact exists where the noise of the project exceeds the background noise by 5 dBA or more (CEC, 2002). It is important to note that the potential for an impact does not mean that there is an impact. Rather, it means that the project noise levels need further evaluation. The Energy Commission Staff concluded that construction noise is typically insignificant if (1) the construction activity is temporary, (2) use of heavy equipment and noisy activities is limited to daytime hours, and (3) all feasible noise abatement measures are implemented for noise-producing equipment (CEC, 2002).

8.5.5.2 Construction Impacts

This subsection addresses the various components of construction noise and vibration.

8.5.5.2.1 Worker Exposure to Noise. Worker exposure levels during construction of the SFERP will vary depending on the phase of the project and the proximity of the workers to the noise-generating activities. Hearing protection will be available for workers and visitors to use as needed throughout the duration of the construction period. A Hearing Protection Plan, which complies with Cal-OSHA requirements, will be incorporated into the Health and Safety Plan.

8.5.5.2.2 Plant Construction Noise. Construction of the SFERP is expected to be typical of other power plants in terms of schedule, equipment used, and other types of activities. The noise level will vary during the construction period, depending upon the construction phase. Construction of power plants can generally be divided into five phases that use different types of construction equipment. The five phases are (1) demolition, site preparation, and excavation; (2) concrete pouring; (3) steel erection; (4) mechanical; and (5) clean-up (Miller et al., 1978). In contrast to PPPU7, steam blows will not be required for the SFERP.

Both the USEPA Office of Noise Abatement and Control and the Empire State Electric Energy Research Company have extensively studied noise from individual pieces of construction equipment as well as from construction sites of power plants and other types of facilities (USEPA, 1971; Barnes et al., 1976). Since specific information on types, quantities, and operating schedules of construction equipment is not available at this point in project development, information from these documents for similarly sized industrial projects will be used. Use of this data, which is between 21 and 26 years old, is conservative since the evolution of construction equipment has been toward quieter designs to protect operators from exposure to high noise levels.

The loudest equipment types generally operating at a site during each phase of construction are presented in Table 8.5-9. The composite average or equivalent site noise level, representing noise from all equipment, is also presented in the table for each phase.

TABLE 8.5-9
Construction Equipment and Composite Site Noise Levels

Construction Phase	Loudest Construction Equipment	Equipment Noise Level (dBA) at 50 feet	Composite Site Noise Level (dBA) at 50 feet
Demolition, Site Clearing, and Excavation	Dump Truck Backhoe	91 85	89
Concrete Pouring	Truck Concrete Mixer	91 85	78
Steel Erection	Derrick Crane Jack Hammer	88 88	87
Mechanical	Derrick Crane Pneumatic Tools	88 86	87
Cleanup	Rock Drill Truck	98 91	89

Source: USEPA, 1971; Barnes et al., 1976.

Average or equivalent construction noise levels projected at various distances from the site are presented in Table 8.5-10. These results are conservative since the only attenuating mechanism considered was divergence of the sound waves in open air. Shielding effects of intervening structures are not included in the calculations. The construction noise may be audible at the nearest dwelling units but is not anticipated to exceed current exposure levels and the noisiest construction activities will be confined to the daytime hours. Table 8.5-11 presents noise levels from common construction equipment at various distances.

TABLE 8.5-10
Average Construction Noise Levels at Various Distances

Construction Phase	Sound Pressure Level (dBA)		
	375 feet	1,500 feet	3,000 feet
Demolition, Site Clearing, and Excavation	71	59	53
Concrete Pouring	60	48	42
Steel Erection	69	57	51
Mechanical	69	57	51
Clean-Up	71	59	53

TABLE 8.5-11
Noise Levels from Common Construction Equipment at Various Distances

Construction Equipment	Typical Sound Pressure Level at 50 feet (dBA)	Typical Sound Pressure Level at 375 feet (dBA)	Typical Sound Pressure Level at 1,500 feet (dBA)
Pile Drivers (20,000-32,000 ft-lbs./blow)	104	86	74
Dozer (250-700 hp)	88	70	58
Front End Loader (6-15 cu. yds.)	88	70	58
Trucks (200-400 hp)	86	68	56
Grader (13 to 16 ft. blade)	85	67	55
Shovels (2-5 cu. yds.)	84	66	54
Portable Generators (50-200 kW)	84	66	54
Derrick Crane (11-20 tons)	83	65	53
Mobile Crane (11-20 tons)	83	65	53
Concrete Pumps (30-150 cu. yds.)	81	63	51
Tractor (3/4 to 2 cu. yds.)	80	62	50
Unquieted Paving Breaker	80	62	50
Quieted Paving Breaker	73	55	43

Noise generated during the testing and commissioning phase of the project is not expected to be substantially different from that produced during normal full-load operation. Starts and abrupt stops are more frequent during this period, but on the whole they are usually short-lived.

8.5.5.2.3 Construction Vibration. Construction vibrations can be divided into three classes, based on the wave form and its source (see Table 8.5-12). Pile driving is anticipated. It will be limited to normal construction hours (during the daytime) and will be of short duration; therefore, no mitigation is required.

TABLE 8.5-12
Construction Vibrations

Wave Form	Example Source
Impact	Impact pile driver or blasting
Steady state	Vibratory pile driver
Pseudo steady state	Double acting pile hammer

8.5.5.3 Operational Impacts

This subsection describes the expected noise impacts from operation of the plant.

8.5.5.3.1 Worker Exposure to Operational Noise. Nearly all components will be specified not to exceed near-field maximum noise levels of 90 dBA at 3 feet (or 85 dBA at 3 feet where available as a vendor standard). Since there are no permanent or semi-permanent workstations located near any piece of noisy plant equipment, no worker's time-weighted average exposure to noise should approach the level allowable under OSHA guidelines. Nevertheless, signs requiring the use of hearing protection devices will be posted in all areas where noise levels commonly exceed 85 dBA, such as inside acoustical enclosures. Outdoor levels throughout the plant will typically range from 90 dBA near certain equipment to roughly 65 dBA in areas more distant from any major noise source.

8.5.5.3.2 Transmission Line and Switchyard Noise Levels. SFERP will connect to the power grid through the PG&E Potrero Substation by two redundant 3-phase 115-kV solid dielectric underground transmission circuits. Two options are being considered for connection to the Potrero Substation. One is to have the circuits enter the substation underground from Illinois Street; the other is to have the circuits enter the substation from 22nd Street to an underground/overhead transition structure located on the eastern portion of the switchyard. One of the electrical effects of high-voltage transmission lines is corona. Corona is the ionization of the air that occurs at the surface of the energized conductor and suspension hardware due to very high electric field strength at the surface of the metal during certain conditions. Corona may result in radio and television reception interference, audible noise, light, and production of ozone. Corona is generally a principle concern with transmission lines of 345 kV and higher. The project's use of shielded solid dielectric cable encased in an underground concrete duct bank will eliminate the corona effects. Consequently, no noise impact is expected from the operation of the electrical transmission lines.

8.5.5.3.3 Process Water Supply Pipeline and Water Pump Station Noise Levels. Operational noise from the buried process water supply pipeline is not anticipated to generate any audible noise. The water pump station will be designed to comply with the City's noise requirements and is not anticipated to increase offsite noise level by a measurable amount.

8.5.5.3.4 Plant Operation Noise Levels. A noise model of the proposed SFERP facility has been developed using source input levels derived from manufacturers' data and field surveys of similar equipment. The noise emissions from the plant have been calculated at the residential receptors of potential concern. The noise levels presented represent the anticipated steady-state level from the plant with essentially all equipment operating.

The model divides the proposed facility into a list of individual point and area noise sources representing each piece of equipment that produces a significant amount of noise. The sound power levels representing the standard performance of each of these components are assigned based either on field measurements of similar equipment made at other existing plants, data supplied by manufacturers, or information found in the technical literature. Using these standard power levels as a basis, the model calculates the sound pressure level that would occur at each receptor from each source after losses from distance, air absorption, blockages, etc. are considered. The sum of all these individual levels is the total plant level at the modeling point. The sound propagation factors used in the model have been adopted from ISO 9613-2 *Acoustics – Sound Attenuation During Propagation Outdoors*.

The sound power levels, by octave band, used in the model are summarized in Table 8.5-13. Noise from the project is predicted not to exceed 54 dBA at either ML1 (the closest residentially zoned receptor) or R1 (the closest dwelling unit)(see Figure 8.5-1). This is consistent with the CEC's 5 dBA over background guideline and complies with LORS.

TABLE 8.5-13
Octave Band Sound Power Levels Used to Model SFERP Operations, dB (Flat)

	Octave Band Center Frequency, Hz									
Plant Component	**31.5**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**dBA**
Stacks[a]	122	115	106	102	94	80	80	83	78	97.7
LM6000 Combustion Turbine Generators (CTG)	116	115.1	110.8	109.4	104.6	101.1	99.4	100.3	90.5	108.3
Cooling Tower	108	108	109	106	101	93	89	87	85	102.4
Chiller	96.2	85.7	91.5	82.6	90.6	89.2	70.1	59	41.4	91.6
Fuel Gas Compressors[b]	116.9	116.6	111.1	111.2	109.4	107.8	109.9	109.1	107.5	116
Gas Cooler[b]	106.8	111.3	107.4	97.7	98.7	93.4	99.4	102.8	101.0	107.3
Transformers	108	111	105	105	100	94	91	88	88	102
SCR Duct Walls	121.4	117	113	106.2	97.1	83.2	75.6	73	62	101.7

Notes:

[a] Includes stack silencers.

[b] If shielding provided by the proposed MUNI Maintenance facility is not sufficient or if this project is operational prior to the construction of the MUNI Maintenance building, a combination of noise barriers or enclosures will be constructed to reduce these levels by at least 13 dBA.

8.5.5.3.5 Tonal Noise. As a general rule, LM6000-based plants, even those without significant noise controls, do not produce discrete tones that are prominent or noticeable at typical receptor distances. At the monitoring locations modeled here, no significant tones are anticipated.

That is not to say that audible tones are impossible—certain sources within the plant such as the combustion turbine inlets, transformers, pump motors, cooling tower fan gearboxes, etc. have been known to sometimes produce significant tones. It is the Applicant's intention to anticipate the potential for audible tones in the design and specification of the plant's equipment and take necessary steps to prevent sources from emitting tones that might be disturbing at the nearest receptors.

8.5.5.3.6 Ground and Airborne Vibration. Similar LM6000-based facilities have not resulted in ground or airborne vibration impacts. The proposed project is primarily driven by gas turbines exhausting into a selective catalytic reduction (SCR) duct and a stack silencer. These very large ducts reduce low frequency noise, which is mainly the source of airborne induced vibration of structures.

The equipment that would be used in the proposed project is well balanced and is designed to produce very low vibration levels throughout the life of the project. An imbalance could contribute to ground vibration levels in the vicinity of the equipment. However, vibration-monitoring systems installed in the equipment are designed to ensure that the equipment remains balanced. Should an imbalance occur, the event would be detected and the equipment would automatically shut down.

8.5.6 Mitigation Measures

The following mitigation measures are anticipated to be included in the project.

8.5.6.1 Noise Mitigation Measure #1

The City shall establish a telephone number for use by the public to report any significant undesirable noise conditions associated with the construction and operation of the project. If the telephone is not staffed 24 hours per day, the project owner shall include an automatic answering feature, with date and time stamp recording, to answer calls when the phone is unattended. This telephone number shall be posted at the project site during construction in a manner visible to passersby. This telephone number shall be maintained until the project has been operational for at least one year.

8.5.6.2 Noise Mitigation Measure #2

Throughout the construction and operation of the project, the project owner shall document, investigate, evaluate, and attempt to resolve all legitimate project related noise complaints.

The City or authorized agent shall:

- Use the Noise Complaint Resolution Form typically suggested by CEC or functionally equivalent procedure to document and respond to each noise complaint.
- Attempt to contact the person(s) making the noise complaint within 24 hours.
- Conduct an investigation to attempt to determine the source of noise related to the complaint.
- If the noise complaint is legitimate, take all feasible measures to reduce the noise at its source.

8.5.6.3 Noise Mitigation Measure #3

Noisy construction or demolition work (that which causes offsite annoyance as evidenced by the filing of a legitimate noise complaint) shall be restricted to 7 a.m. to 8 p.m. unless otherwise permitted in accordance with the San Francisco Municipal Code Section 2908.

Construction equipment shall comply with the noise level limits of the San Francisco Municipal Code, Section 2907. Haul trucks and other engine-powered equipment shall be equipped with adequate mufflers. Haul trucks shall be operated in accordance with posted speed limits. Truck engine exhaust brake use shall be limited to emergencies.

8.5.6.4 Noise Mitigation Measure #4

The project design and implementation shall include noise mitigation measures adequate to ensure that operation of the project will not exceed the noise standards of the City Municipal Code. Specifically, noise caused by operation of the project shall not exceed the existing background noise level (49 dBA – calculated by averaging the 4 quietest continuous hours recorded at ML1) by more than 5 dBA. The resulting noise levels will, therefore, not exceed 54 dBA at ML1 or R1.

Furthermore, the project will not result in noise impacts at residentially or commercially zoned areas in excess of the City's noise zoning criteria. Live/work units located in areas zoned light or heavy industrial (M1 or M2) are considered industrial uses (Edwards, 2005).

8.5.7 Involved Agencies and Agency Contacts

Agency contacts relative to noise issues are presented in Table 8.5-14.

TABLE 8.5-14
Agency Contacts

Agency	Contact	Issue	Telephone
San Francisco Police Department	Officer Qwan 201 Williams Street San Francisco, CA	Article 29 of Police Code	(415) 671-2300
San Francisco Department of Public Health	Tom Rivard, Senior Environmental Health Inspector	Noise Standards	(415) 252-3840
San Francisco Planning Department	Jasper Rubin, Planner/Geographer 1600 Mission Street San Francisco, CA 94103-2414	Noise Standards	(415) 558-6310

8.5.8 Permits Required and Permit Schedule

No permits are required; therefore, there is no permit schedule.

8.5.9 References

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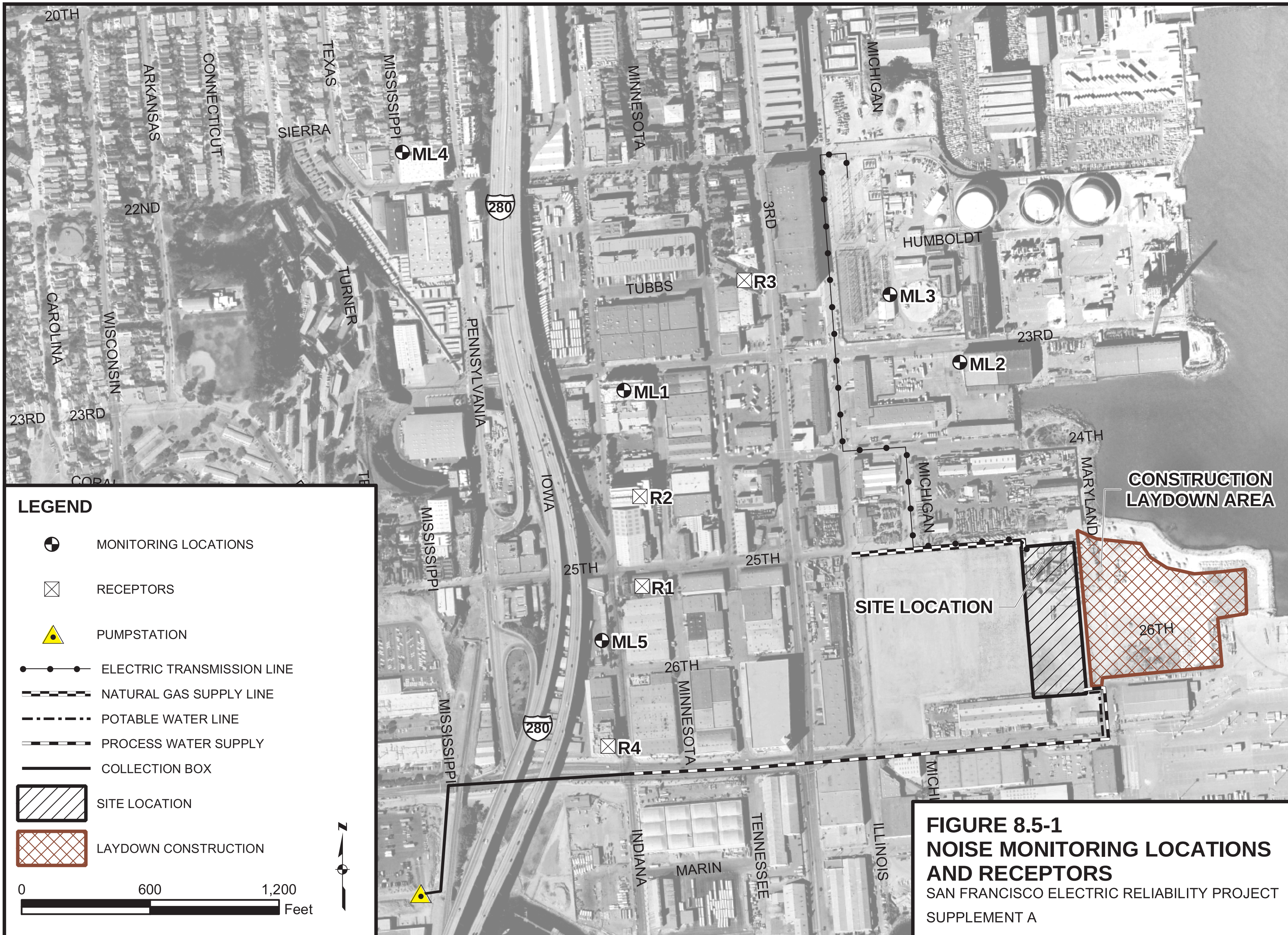

FIGURE 8.5-1
NOISE MONITORING LOCATIONS AND RECEPTORS
SAN FRANCISCO ELECTRIC RELIABILITY PROJECT
SUPPLEMENT A

CH2MHILL

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